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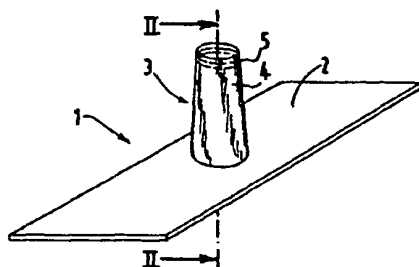
ARTICLE OF FEMININE HYGIENE SUCH AS A MENSTRUAL NAPKIN

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List of documents cited in the
preliminary search report: Refer to the end of the present
document

[Abstract]

The invention relates to an article of feminine hygiene such as a menstrual napkin.

According to the invention, this article (1) has external protection (2) which absorbs body fluids, which is placed against the body of the user, and an internal device (3) for drainage of the aforementioned fluids or menstrual flow, which is arranged in a plane perpendicular to that of external protection (2), and which is intended to capture the aforementioned fluids directly in the vagina and to drain them into the external protection.



The invention relates generally to an article of feminine hygiene and particularly to a menstrual napkin which provides complete sealing and comfort for the users.

Two groups of feminine hygiene articles with differing structure, shape and positioning currently exist on the menstrual protection market: on one hand, external protections or menstrual napkins, and on the other hand, internal protections or tampons. Each of these product types has major disadvantages.

With regard to menstrual napkins, regardless of their shape and the improvements made on them, they have the principal defect of not completely eliminating lateral leaks which damage and soil the undergarments on which they are placed. In effect, the menstrual napkins are sometimes poorly positioned with respect to the body of the woman: they are placed too far forward or too far back or else are shifted laterally on the bottom of the undergarment, consequently causing leaks of liquid on the undergarment. Moreover, the movements and displacements of the female user throughout the day most often deform the edges of the napkin, which leads to lateral flow of the liquids outside the napkin. When [the wearer] is lying down, the leaks are most often unavoidable at the front or the back of the napkin because of the positioning and the shape of the latter, which is provided preferably for use in a roughly horizontal plane. Surveys have reported that fifteen to fifty percent of the women who wear menstrual napkins complain of leaks.

Furthermore, the relatively large dimensions of the menstrual napkins make wearing them rather uncomfortable.

As for tampons, they have certain disadvantages such as irritation, pain, and risk of bacterial infections. Furthermore, when they absorb the menstrual flow, they tend to swell which makes it difficult to remove them. Their saturation causes leaks. In effect, when they are at a state of maximum absorption, in other words saturated, and furthermore compressed because of their position, they release liquid.

In order to overcome these disadvantages, several solutions have been proposed, but clearly none has met with success on the market. One of these solutions consists of a menstrual

napkin, therefore an external protection, which is provided with a protruding central zone which is placed between the labia of the vulva without being introduced into the vagina, in comparison with a tampon. This type of article, while being external, has a "semi-internal" zone. It is illustrated by the following patents.

American Patent No. 4 046 147 describes a menstrual napkin obtained from a sheet of absorbent material folded in such a way as to form a pad of rectangular shape and a solid protuberance projecting towards the anatomy of the female user, roughly in the shape of a truncated pyramid with a rectangular base, which is arranged in the center of the pad. The absorption of such a napkin is concentrated at the site of the protuberance and reduced at the ends. The upper surface of the protuberance has a central zone in the form of a slight depression with respect to the periphery of this upper surface. This zone in the form of a central depression enables the products of desquamation to be collected.

But if the debris of the mucosa remain on the surface of the protuberance, this protuberance can no longer absorb the menstrual flow. Moreover, since the absorption is concentrated at the site of the protuberance, there are again disadvantages similar to those described in the preceding regarding tampons.

French Patent No. 2 653 328 discloses another menstrual protection of this type, which has an absorbent pad of small thickness consisting of a web which is permeable to the body fluids coming in contact with the female user, associated with absorbent fibrous material, the pad having an elongated shape with rounded front part and rear part, and having, in the vicinity of its longitudinal axis, a protuberance intended for being inserted completely between the exterior labia of the vulva without penetrating into the vagina. This protuberance has roughly the shape of a cylinder which is attached to the pad in a narrow zone with respect to the diameter of the cylinder so as to form two concave zones on both sides of the protuberance. This protuberance is moreover made up of a non-woven web permeable to the body fluids, which is associated with absorbent fibrous material containing in its middle a superabsorbent material intended for capturing and gelling the menstrual flow as soon as it is emitted. But this structure has the disadvantage of clogging the protuberance without draining the menstrual flow towards other zones of absorption.

Another solution put forward is a very localized menstrual napkin positioned in the vulva.

South African Patent No. 754 481 discloses a menstrual napkin which has an absorbent pad covered with an envelope and one of whose ends is in the form of a strip which has no pad. The length, the width and the thickness of the napkin are such that it is secured between the external and internal labia of the vulva and covers the entrance of the vagina. This napkin is

maintained in position by the natural catching action of the muscles of the external labia of the vulva.

But this liner does not solve the problem of drainage of body fluids, and problems such as excessive retention of liquids in the interlabial space appear.

French Patent Application No. 2 359 600 and American Patent Nos. 3 983 873 and 4 175 561 describe similar protections of suitable geometric form for being inserted in the interlabial space. These products offer a certain discomfort and are not suitable for absorption of the menstrual flow but are used for less abundant, unintentional flows of liquids such as urine.

A third solution which is provided is a protection of internal tampon type, which is introduced into the vagina, which has an expansion at its base, perpendicular to the part introduced into the vagina and which is inserted between the labia of the vulva.

American Patent No. 3 690 321 corresponds to this solution which in fact amounts to an internal protection. In effect, the whole structure of the protection, both the tampon and the pad arranged transversely to the longitudinal axis of the tampon, is absorbent.

But this completely absorbent protection does not overcome the set of problems occurring with the use of conventional tampons. A major disadvantage of such a protection is the permanent opening of the labia during use. In effect, the labia can no longer function as a natural barrier against bacteria, which leads to risks of infections. Furthermore, the presence of a voluminous body between the labia makes wearing this protection particularly uncomfortable.

The present invention aims to palliate the disadvantages mentioned in the preceding, including leaks mainly, by providing an article of hygiene which is capable of ensuring the drainage of the menstrual flow from an internal zone close to the source of the flow, in the vagina, by capturing it and guiding it towards an external absorbent zone.

The invention also aims to prevent absorption and retention of the menstrual flow in the internal parts of the female anatomy, by draining the fluids towards the exterior of the body, into an external absorbent zone, that is to say by moving the flow away from the origin of its flow.

The invention therefore relates to a completely sealed article of hygiene, that is to say which eliminates any risk of leakage, regardless of the position and the movements of the female user.

The invention also relates to an article of feminine hygiene which has improved comfort because of the possible reduction of the dimensions of the external absorbent zone such as an absorbent pad.

The invention furthermore relates to an article of hygiene which has an excellent holding ability, which therefore has the advantage of being always well positioned with respect to the

body of the woman, by ensuring contact of the body with the external protection, and by adapting to the movements of the female user.

The new solution offered by the invention results from an advantageous combination of an absorbent external protection and an internal protection or device for drainage of the body fluids from the interior of the vagina towards the external absorbent protection.

According to an advantageous characteristic of the invention, the article of feminine hygiene has an external protection which absorbs the body fluids, which is intended to go against the body of the female user, and an internal device for drainage of the aforementioned fluids or menstrual flow which forms an angle with said external protection and which is intended to capture the aforementioned fluids directly in the vagina and to drain them into said external protection.

According to another characteristic of the invention, the aforementioned drainage device has a means forming a drain or wick which is introduced into the vagina.

According to an additional characteristic of the invention, the aforementioned drainage device has a means for positioning of said means forming a drain inside the vagina, and if necessary, a means for extraction of said positioning means.

According to a characteristic of the invention which is also advantageous, said external protection has a pad which absorbs the fluids and a film which is impermeable to the fluids which is arranged under said pad.

According to a preferred characteristic of the invention, the aforementioned means forming a drain is made of flexible and hydrophilic material.

Other characteristics and advantages of the invention will appear more clearly with detailed reading of the following description in reference to the appended drawings in which:

- Figure 1 diagrammatically represents the article of hygiene according to the invention, in perspective,

- Figure 2 is a cross section according to plane II-II of the article represented in Figure 1 and corresponding to one embodiment of the invention,

- Figure 3 is a cross section according to plane II-II of the article represented in Figure 1 and corresponding to another embodiment of the article according to the invention, which article is provided with a means for positioning of the means forming a drain in the vagina,

- Figure 4 illustrates the article represented in Figure 3 when the positioning means is withdrawn,

- Figure 5 represents in perspective another embodiment of the article of hygiene according to the invention, and

- Figure 6 is a cross section according to plane V-V of the article represented in Figure 5.

In reference to Figures 1 and 2, article of feminine hygiene 1 or menstrual napkin according to the invention has external protection 2 and internal protection or device 3 which is introduced into the vagina of the female user. Internal device 3 is a device for drainage of body fluids and more precisely of menstrual flow, which device captures the menstrual flow as close as possible to the source, inside the vagina, and which then conducts this flow towards the exterior of the female anatomy, into external protection 2 whose function is to absorb the fluids. In other words, the function of this drainage device is to go into the vagina and direct the menstrual flow directly into an external absorbent structure. This makes it possible to regularize the flow of emitted fluids and to channel them so that the flow is evacuated from the vagina in a more controlled manner. The main advantage proceeding from this is the complete elimination of the risks of untimely leaks which occur in the articles of feminine hygiene of prior art, in the case of tampons as well as menstrual napkins.

Internal device 3 has means 4 forming a drain which can be a wick, of strip or cord type present in the form of a thread or several associated threads, of varying thickness, or else in the form of a sleeve or any tubular means suited to the anatomy of the vagina. The means forming a drain can also be made up of a part of a web arranged on the surface of external protection 2 and forming a projection which can be introduced inside the vagina and fulfill the drainage function. Such webs have the advantage of fulfilling two functions: internal drainage and penetration of the flow into the pad at the surface of the external protection. If the means forming a drain is tubular, its cross section must be sufficient to allow the introduction of a finger of the female user. The drainage device is in effect introduced and placed in the vagina by the female user by finger as described hereafter.

Means 4 forming a drain, illustrated in Figures 1 and 2, which is only an example, is tubular in shape, preferably open at its upper end. It is also possible to envisage a means forming a drain of tubular shape which is closed at its upper end. But the existence of an opening facilitates the entrance of the menstrual flow inside the drain. However, the opening must be limited in size so as not to allow the finger of the female user to pass through during positioning.

The material used for the means forming a drain must be very flexible, not too voluminous, very soft, and medically tested. The bacteriological testing parameters are the same as those of tampons. It is in effect necessary to verify by tests the level of presence of the following bacteria: all aerobic mesophilic bacteria, yeasts and molds and the following pathogenic bacteria: *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*.

The flexibility of the material forming the drain contributes comfort, [and] eliminates the risks of irritation of the other internal protections such as tampons introduced into the vagina and/or between the labia of the vulva. Moreover, the combination of the flexibility and fineness

of the material allows the means forming a drain to occupy only a very reduced volume. The means forming a drain must also have sufficient tensile strength when female user is removing the internal protection.

It is generally formed by fibers, filaments or threads, preferably an assembly of threads, that is to say a textile material, for example, a cord or a plait or else a fabric in knit, woven or non-woven form. The fibers are natural, synthetic or mixed. Natural fibers are chosen, for example, from cotton and viscose. Synthetic fibers are, for example, polyamide fibers and can also be extruded.

It is possible to use materials which are used conventionally as permeable web on menstrual napkins: non-woven or plastic materials such as a perforated plastic film of the Reticulon® (registered trademark) type which corresponds to the properties required for the means forming a drain: flexibility, fineness, tensile strength and non-absorption of the fluids.

The material is possibly elastic and in this case contains, for example, Lycra® (registered trademark). If the material is elastic, it must be all the more flexible in order not to squeeze the finger, so that positioning is easy.

If the material is not elastic, it must be sufficiently fine so that the means forming a drain is not too bulky once in place.

Furthermore, this material can be hydrophobic, that is to say that it will drain the menstrual flow by gravity without absorbing it. For example, in the case of hollow fibers forming the drain, the flow will not penetrate inside the fibers but will slide by gravity along these fibers. The material can also be hydrophilic. The flow will then be collected by the means forming a drain, by impregnation, before migrating by capillary action towards the absorbent external protection. In the aforementioned case of hollow fibers forming the drain, the menstrual flow will penetrate inside the fibers by passing through the wall of the hollow fibers and will be drained by capillary action into the absorbent external protection. This solution is of interest because the flow will be well guided regardless of the position of the female user, including when lying down in particular.

Internal drainage device 3, if necessary, at its upper end, has means 5 for holding of means 4 forming a drain, inside the vagina. The holding means can be of different shapes such as a ring, an arch arranged at the end of the means forming a drain in a plane roughly perpendicular to the axis of the latter or else, for example, a line segment which corresponds to the diameter of a circle delimited by the walls of the vagina. It can also be arranged in a plane parallel to the axis of the means forming a drain. It is then present in the form of a flexible rod arranged along the wall of the means forming a drain or in the form of an overturned U situated at the end of the

means forming a drain and of which the two ends are in contact with the wall of the means forming a drain.

This holding means does not exist when the structure and the shape of the means forming a drain are such that the latter is held in place directly by itself.

In Figure 1, holding means 5 is present in the form of a ring of toric shape with a torus diameter between approximately 10 and 30 mm and preferably between approximately 15 and 25 mm, and with a bore diameter in the interval between approximately 1 and 3 mm. The material used for this ring must be sufficiently flexible not to hinder or irritate the user during positioning of the means forming a drain and during wearing of the internal drainage device.

The positioning of the internal device is done by finger, and the ring ensures the holding of the means forming a drain in its outspread state elongated towards the bottom of the vagina.

The internal device moreover has means 6 for positioning of the internal drainage device in the vagina, which can be a positioning finger, an elastic, deformable membrane or any equivalent means.

Another solution is also possible in which the means forming a drain and the positioning means are one piece. For this purpose, the materials forming this drain which is a fortiori tubular are chosen so that the internal surface of the drain is impermeable to the flow and the external surface conducts the flow on its external surface. In this particular case, it is no longer necessary to withdraw the positioning means once the internal protection is introduced in the vagina.

In Figure 2, positioning means 6 is an elastic impermeable membrane, which is planar at rest and which can be deformed by the force exerted by the finger when the female user introduces means 4 forming a drain into the vagina. It is possible to provide a reinforcement strip around impermeable membrane 6 in order to prevent deformation of the external protection.

Drainage device 2 [sic; 3] is arranged roughly perpendicularly to external protection 2.

The latter is composed of absorbent pad 7, web 8 of the non-woven type which is permeable to the fluids, and film 9 which is impermeable to the fluids, for example, made of polyethylene. Lines of adhesive can be provided under impermeable film 9 so that the article can be attached by adhesion on an undergarment. Silicone coated strip 10 is then arranged under film 9 which is impermeable to the fluids and has a perforation at the site of drainage device 3. This silicone coated strip will be removed during use of the liner. But it should be noted that the deposition of adhesive material under the external protection in order to attach the article on the undergarment is in this case only additional "security", the holding of the article being already ensured by the positioning of the internal protection.

Means 4 forming a drain is connected by any means of attachment such as stitching, adhesive or heat fusing on pad 7 in such a way that pad 7 can directly absorb the flow coming

from means 4 forming a drain. This means of attachment must be suitable so as not to hinder the routing of the liquids into the pad. The means forming a drain can be attached anywhere in the pad, including at the front and rear ends of the latter. The means forming a drain can also be extended in the form of a permeable web over all or part of the surface of the pad, using as material, for example, a perforated plastic film. Elastic membrane 6 allowing the positioning of means 4 forming a drain can be attached on impermeable film 9. Consequently, the sealing of the article of hygiene is ensured.

The material forming the pad is based on cellulose fibers, bound or not, or cellulose foam, if necessary with addition of superabsorbents.

Given that the menstrual flow is guided and oriented directly into the absorbent pad, the dimensions of the external protection can be reduced in length and width as well as in thickness with respect to the menstrual napkins of prior art. The dimensions are those of a briefs protector when superabsorbents are introduced in the pad. Smaller dimensions than those of a briefs protector can even be envisaged by substantially reducing the dimensions of the pad. Consequently, the external protection of minimized volume, which therefore has a very small space requirement, has a very reduced surface of contact with the undergarment and allows the elimination of any additional means of attachment such as the deposition of adhesive. The external protection becomes much more discrete and very comfortable for the female user.

Consequently, this article solves problems generated both by menstrual napkins and by tampons.

The positioning of this article is done in two steps. In a first step, the female user positions internal drainage device 3, and then in a second step, she arranges the undergarment under the lower surface of the article of hygiene, removing the silicone coated strip beforehand if the latter is provided, so that the external protection sticks to the undergarment.

Other embodiments of the article of hygiene according to the invention are described hereafter.

Figures 3 and 4 illustrate an article of which drainage device 33 has means 66 for positioning of means 44 forming a drain, which is an impermeable film in the form of a sleeve, which is removed using cord 100 attached to the bottom of the sleeve at its upper end 101. The base of sleeve 66 is attached by any appropriate means on film 99 which is impermeable to the fluids so as to ensure the sealing of drainage device 33. Furthermore, the tubular positioning means can be situated outside the means forming a drain, with an opening provided at its base for positioning by finger.

Figure 5 illustrates an article of hygiene according to the invention in which the means forming a drain is wick 444 consisting of tangled hydrophobic threads or hydrophilic fibers. The

means forming a drain could also be a network of wicks arranged, for example, in a truncated conical manner around a central axis. Drainage device 333 also has sleeve 666 for positioning of the wick in the vagina. Ring 555 or any equivalent means of holding the wick in position is in this case absolutely necessary. The wick is placed against the external surface of sleeve 666 when the drainage device is positioned; then it remains in position in the vagina by means of ring 555.

In reference to Figure 6, wick 444 extends into the external protection, in this case into the pad, and is attached by its ends 444a and 444b to pad 777.

The drainage device corresponding to the internal protection can be conical, truncated conical and preferably tubular in shape. The external protection can be rectangular, oblong, hourglass-shaped or other.

The article according to the invention can be manufactured easily in a line continuously. Some manufacturing processes are given hereafter as illustrations.

On one hand, the external protection is manufactured according to conventional methods for assembling of the elements forming a menstrual napkin or a briefs protector, such as a pad, a film which is impermeable to the fluids arranged under the pad, and an upper web which is permeable to the fluids, which is applied to the surface of the pad.

Once assembled, the external protection is perforated, for example, by stamping in order to free a space which is intended for the means forming a drain and possibly for the means for positioning of the drain.

On the other hand, the drain is manufactured. When the drain is tubular, several embodiments are possible.

From a width of material, one cuts out and longitudinally fuses two plies of textile material, for example, a loose fabric forming a net or screen, or else two plies of a perforated film, the two plies being placed one on top of the other in order to form a tube. Then one transversely cuts and fuses the tube which is obtained, only closing a single end of the tube by fusing. If the lateral edges of the sleeve which is obtained are too irritating (lack of softness), the sleeve is turned inside out.

Directly starting from a tube, it is sufficient to transversely cut the tube and to fuse it at one of its ends.

It is also possible to use as starting material, for another embodiment of the means forming a drain, a web which is intended to be placed also on the surface of the pad of the external protection. The web is deformed cold or with heat, for example, by a heating die which is applied against a countermarking plate, the web being placed between the die and the plate. The web thus deformed has a protuberance which forms the drain.

It is also possible to cut two web plies placed one on the other, according to a line defining the profile of the means forming a drain. Then, the elements of the web which are cut out according to this line are fused in such a way as to form the drain and the element corresponding to the permeable web which will be assembled with the other elements of the external protection.

For non-tubular drains, it is possible to start with a small width of material which is cut to the desired width for producing the drain. The cut piece of material width is then shaped to give it the profile of a drain, and it is placed on the pad of the external protection.

It is also possible to use a wick formed of several threads, which wick is attached vertically on the pad.

The means of positioning of the drain is furthermore manufactured.

In the case of a positioning finger, one uses in particular a flexible plastic material molded in the shape of a finger, on which one attaches an extraction cord; then the finger is overturned, the cord remaining in place inside the latter.

The base of the finger and more precisely its contour is sealed onto a support in order to hold the base of the finger during positioning of the drain.

The assembly formed by the positioning finger and the drain placed on the finger is fit on a vertical support rod. The latter guides the positioning finger and the drain into the perforation provided for this purpose in the pad of the external protection described in the preceding. The assembly formed by the drain and the positioning finger is fixed onto the pad; then, the lower part of the pad and the sealing zone are covered with an impermeable film or web.

When the positioning means is a membrane which can be deformed under the pressure of a finger, a patch is cut from a sheet of appropriate material, and its contours are fixed onto a rigid support.

Furthermore, the drain is attached on the pad, being fit on a support rod beforehand, which is intended to slip and position the drain in the perforation provided for this purpose in the pad. The drain is fixed to the pad preferably on its lower part.

As for the patch or membrane for positioning of the drain, it is placed under the absorbent pad. The impermeable film is perforated at the site of the patch, and it is placed below the patch. The patch and its support are fixed onto the impermeable film in order to ensure the sealing of the article, and the finished article is obtained.

The invention is not limited to the embodiments described in the preceding and includes all equivalent and additional means within reach of a person skilled in the art.

Claims

1. An article of feminine hygiene (1) such as a menstrual napkin, characterized by the fact that it has external protection (2) which absorbs the body fluids and which is intended to be placed against the body of the female user, and internal device (3) for drainage of the aforementioned fluids or menstrual flow which forms an angle with said external protection (2) and which is intended to capture the aforementioned fluids directly in the vagina and to drain them into said external protection (2).

2. An article according to Claim 1, characterized by the fact that the aforementioned drainage device (3) has means (4) forming a drain or wick, preferably tubular in shape, which is introduced into the vagina.

3. An article according to Claim 2, characterized by the fact that the aforementioned drainage device (3) has means (6) for positioning of said means (4) forming a drain inside the vagina, and if necessary, a means for extraction of said positioning means.

4. An article according to Claim 3, characterized by the fact that said positioning means is a film in the shape of a finger which is positioned inside said means forming a drain before positioning of the aforementioned drainage device in the vagina and which is removed once the aforementioned drainage device is in position in the vagina, by said means of extraction.

5. An article according to Claim 3, characterized by the fact that said positioning means (6) and said means (4) forming a drain are one and the same piece which is tubular in particular, of which the internal surface is impermeable to the flow and the external surface conducts fluids.

6. An article according to Claim 3, characterized by the fact that said positioning means (6) is a membrane made of flexible, elastic and impermeable material deforming during positioning of the means forming a drain.

7. An article according to one of Claims 2 to 6, characterized by the fact that the aforementioned drainage device (3) moreover has means (5) for holding said means (4) forming a drain in position in the vagina.

8. An article according to Claim 7, characterized by the fact that said holding means (5) is a ring of toric shape or a portion of a ring arranged at the upper end of means (4) forming a drain.

9. An article according to one of Claims 2 to 8, characterized by the fact that the aforementioned means (4) forming a drain is made of flexible, preferably hydrophilic material.

10. An article according to one of Claims 2 to 8, characterized by the fact that the aforementioned means (4) forming a drain is made of flexible and hydrophobic material.

11. An article according to one of Claims 2 to 10, characterized by the fact that said means (4) forming a drain is made out of elastic material.

12. An article according to one of the preceding claims, characterized by the fact that said external protection (2) has pad (7) which absorbs the fluids and film (9) which is impermeable to the fluids which is arranged under said absorbent pad (7).

13. An article according to one of Claims 3 to 6 and Claim 12, characterized by the fact that said positioning means (6) is attached on said impermeable film (9).

14. An article according to Claim 12, characterized by the fact that the means forming a drain is a web, of the perforated plastic film type, and by the fact that it extends over the surface of the external protection forming a web which is permeable to the body fluids.

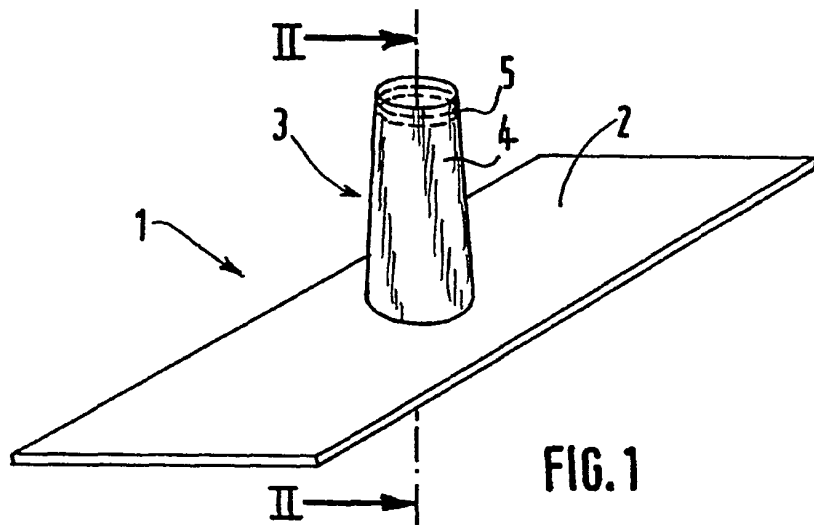


FIG. 1

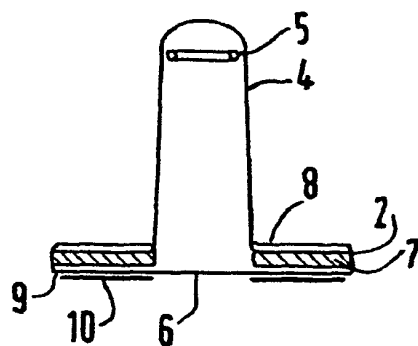


FIG. 2

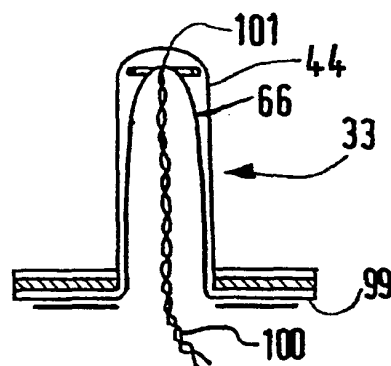
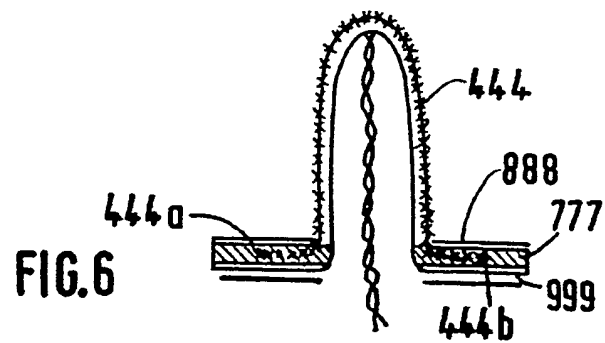
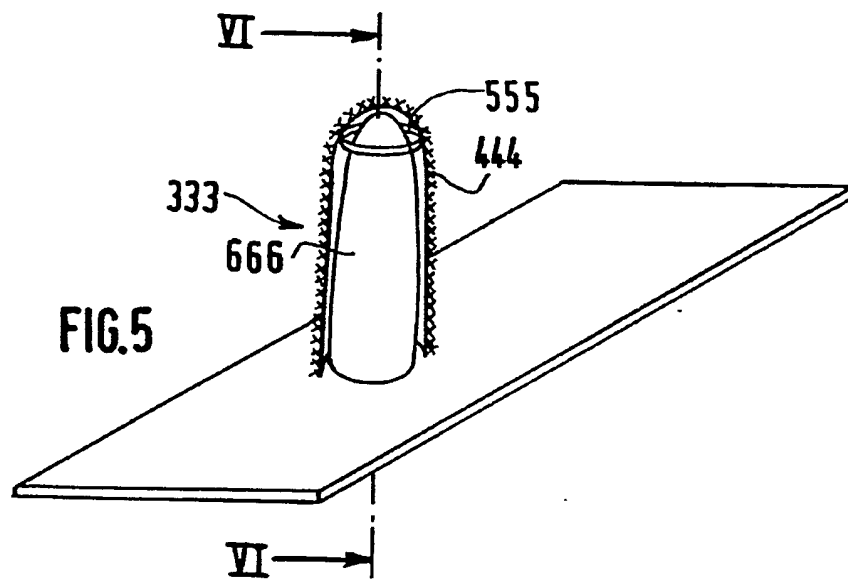
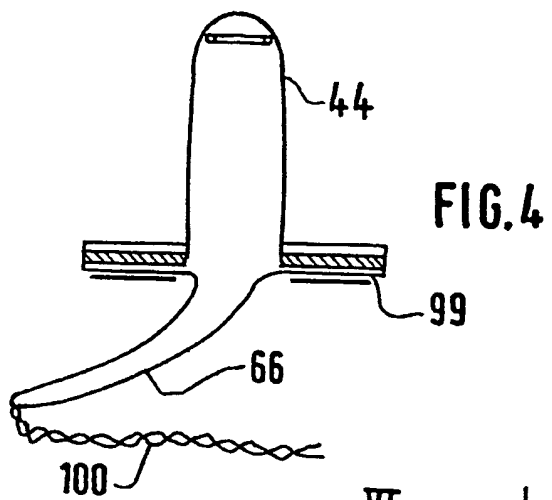


FIG. 3



FRENCH REPUBLIC
National Institute
of Industrial Property

Application Number
Number FR 484081
FR 9303851

SEARCH REPORT
established on the basis of the most
recent claims filed before the start
of the search

DOCUMENTS CONSIDERED TO BE RELEVANT		Claims concerned in the examined document	
Category	Citation of document with indication, where appropriate, of relevant passages		
X	US-A-3 905 372 (M. C. DENKINGER) * the entire document * ---	1-3, 9-11,14	TECHNICAL FIELDS SEARCHED (Int. Cl. ⁵) A61F
X	US-A-3 420 234 (J. T. PHELPS) * the entire document * ---	1-3, 9-11,14	
X	US-A-3 037 506 (S. PENKSA) * the entire document * ---	1-3,9,10	
X	US-A-3 690 321 (S. Z. HIRSCHMAN) * figure 5 * ----	1	
Date of completion of the search December 16, 1993		Examiner Argentini, A	
CATEGORY OF CITED DOCUMENTS			
X: Particularly relevant if taken alone.		T: Theory or principle underlying the invention.	
Y: Particularly relevant if combined with another document of the same category.		E: Earlier patent document, but published on, or after the filing date.	
A: Technological background.		D: Document cited in the application.	
O: Non-written disclosure.		L: Document cited for other reasons.	
P: Intermediate document.		&: Member of the same patent family, corresponding document.	